



Environmental Policy and Technology Project

**For the New Independent States
of the Former Soviet Union**

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CENTRAL ASIAN REPUBLICS

FINAL REPORT

Delivery Order No. 8

**Central Asian Republics: Regional Water Management and
Cooperation Project**

Prepared for:
Bureau for Europe and the New Independent States
U.S. Agency for International Development

Prepared by:
Environmental Policy and Technology Project
A USAID Project Consortium Led by CH2M HILL

PREFACE

Under the 1992 Freedom Support Act, the United States Congress initiated a program to provide assistance to new independent states (NIS) of the former Soviet Union. Cooperative Agreements were signed between representatives of the U.S. government and each country in which assistance was to be undertaken. The U. S. Agency for International Development (USAID) was given the responsibility to coordinate all U. S. Government assistance to the NIS under the Act. The strategic objectives of USAID's assistance to the NIS were to promote:

1. Environmentally sound, sustainable economic development during the transition to a market based economy;
2. Reduction in pollution-related risks to health; and
3. Reduction of the threats to the global and regional environment.

Through competitive bidding, USAID awarded a multi-year contract to a team managed by CH2M HILL International Services, Inc. (CH2M HILL) to support implementation of an environmental assistance program to republics of the former Soviet Union. Under this contract, termed the Environmental Policy and Technology (EPT) Project, CH2M HILL was to assist USAID's missions in Moscow, Kyiv, and Almaty undertake a program to promote environmental improvements in the NIS.

The CH2M HILL team included the following organizations:

- ! Center for International Environmental Law
- ! Clark Atlanta University/HBCUMI Environmental Consortium
- ! Consortium for International Development
- ! Ecojuris
- ! Environmental Compliance, Inc.
- ! Harvard Institute for International Development
- ! Hughes Technical Services Company
- ! International Programs Consortium
- ! International Resources Group, Ltd.
- ! Interfax Newsagency
- ! K&M Engineering
- ! Ogden Environmental and Energy Services Company
- ! World Wildlife Fund (US).

The USAID mission in Almaty supports environmental, and other, assistance programs to the Central Asian Republics. CH2M HILL established an office in Almaty, Kazakhstan to manage and support activities in the Central Asian Republics under the EPT Project, including country-specific activities in Kazakhstan, Turkmenistan, and Uzbekistan and region-wide activities benefitting all five republics. As appropriate, field offices were established at specific project sites within the republics. The project's headquarters office in Washington, D.C. provided overall direction and management support for project activities in all regions.

This report was prepared as a contractually required deliverable under the contract between USAID and CH2M HILL. Although work on this report was conducted in cooperation with the assisted governments and USAID, the findings and recommendations are those of the CH2M HILL team. They do not necessarily represent official positions of the governments of the assisted countries nor of USAID.

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Section 1 Introduction

1.1 Overview of the U.S. Aral Sea Program

The Aral Sea is a major environmental disaster in Central Asia which directly affects Kazakhstan, Uzbekistan, and Turkmenistan, and indirectly the Kyrgyz Republic and Tajikistan. Thirty years ago the Aral Sea was the fourth largest inland lake in the world. Today the sea level has fallen 12 meters, the surface area has been reduced by one-half, and the salinity levels have tripled. The effects of these changes include: destroyed ecosystems; an end to commercial fishing; a dramatic decline in agricultural productivity brought on by increased soil salinity and localized climate change leading to a drastically shortened and much drier growing season; contaminated ground water; and a severe public health crisis in the areas surrounding the Aral Sea. These effects combine to create one of the world's largest environmental disasters, caused as a direct result of decisions taken during the Soviet era to focus primarily on the production of cotton and rice.

In August 1990, Senator Al Gore visited the Aral Sea region of the Central Asia Republics to witness the "impact of a poor irrigation strategy." As Vice President he has made the Aral Sea disaster zone a high priority for the United States Agency for International Development (USAID) assistance.

In March 1993, the presidents of the five Central Asian Republics met in Kyzyl-Orda, Kazakhstan and established an Interstate Council for the Aral Sea (ICAS), pledging one percent of the GDP in each country to be devoted to addressing problems of the Aral Sea. In July 1993, Secretary of State Warren Christopher recommended the execution of bilateral programs and the support of multilateral programs for international cooperation on Aral Sea projects to: provide technical support to improve water quality; address immediate public health needs; and develop effective regional water management policy mechanisms.

In October 1993, the Environmental Policy and Technology (EPT) Project contract, designed to support implementation of USAID's environmental assistance to the republics of the former Soviet Union, was awarded to a team managed by CH2M HILL International Services, Inc. (CH2M HILL). Four delivery orders for work to support the Aral Sea Program were executed under the EPT Project contract in 1994:

Delivery Order No. 2 - Potable Water System for Tashauz Oblast: Turkmenbashi Water Treatment and Dispensing System (Turkmenistan);

Delivery Order No. 4 - Predesign Activities for Potable Water Projects in the Aral Sea Basin and Environmental Action Plan (EAP Activity) (Kazakhstan and Uzbekistan);

Delivery Order No. 6 - Potable Water Treatment Plant/Distribution System and Public Health Improvements for Khorezm Oblast (Urgench) and the Republic of Karakalpakistan (Nukus) (Uzbekistan);

Delivery Order No. 7 - Potable Water Distribution System and Public Health Improvements for Kzyl Orda Oblast and the Cities of Aralsk and Kazalinsk (Kazakhstan);

Delivery Order No. 8 - Central Asian Republics: Regional Water Management and Cooperation Project (five Central Asian Republics).

Delivery Order No. 12 - *Sustainable Water Management in the Aral Sea Basin* - covering all five Central Asian Republics was awarded in 1995. This delivery order provided for the expansion of the country-specific potable water and public health and sanitation activities initiated in Kazakhstan, Turkmenistan, and Uzbekistan under Delivery Order Nos. 2, 4, 6, and 7 and for the initiation of activities specifically aimed at enhancing the sustainability of these efforts. It also provided for the expansion of the regional water management and cooperation activities initiated under Delivery Order No. 8.

Delivery Order No. 14 - *Water and Environmental Management Policy in Uzbekistan* - was awarded in 1996.

1.2 Introduction to Delivery Order No. 8

Delivery Order No. 8 (DO 8) was designed to meet the objective of fostering support for increased regional water management cooperation among the Central Asian Republics. The principal surface water sources in the region are the river basins of the Amu Darya and Syr Darya, the main tributaries to the Aral Sea. The source for these rivers is in the mountainous states of Kyrgyzstan and Tajikistan, where water use for energy production competes with water use for agricultural production in the countries of Kazakhstan, Turkmenistan and Uzbekistan. The issues surrounding the Aral Sea crisis are cross-national, and policy solutions require regional cooperation among the five newly independent Central Asian Republics (CAR). Since water flows among all of the Republics and since it is shared in different ways, there must be significant cooperation among the water sharing republics, especially in the Syr Darya and Amu Darya basins.

Work begun under DO 8 was continued under Delivery Order No. 12.

This report reviews the scope of work, deliverables and major accomplishments of and lessons learned from the work carried out under Delivery Order No. 8. The body of this report contains four main sections : II. Delivery Order Objectives and Scope; III. Deliverables; IV. Major Accomplishments; and V. Lessons Learned.

Section 2

Delivery Order Objectives and Scope

2.1 Delivery Order Objectives

The purpose of the Regional Cooperation in Water Management Program under DO 8 was to share U.S. expertise in water resources management with Central Asian counterparts. The program's objective was to help develop legal, policy, and institutional arrangements for the management of a complex international water system with serious environmental problems.

2.2 Delivery Order Scope

2.2.1 Original Scope of Work

The original scope of work of Delivery Order No. 8 specified the provision of 100 hours of labor for workshop planning, preliminary design, ascertaining availability of experts to conduct workshops, and other logistical support as needed for two workshops. The period of performance was from August 4, 1994, through September 15, 1994. The delivery order was subsequently amended to broaden the scope of work.

2.2.2 Modification No. 1

Modification No. 1 to Delivery Order No. 8 specified several additional specific tasks, substantially increased funding, and extended the period of performance to September 25, 1996. Six components were specified and designated as Tasks A-F.

Task A was designed to prepare and conduct a minimum of three regional workshops as a follow-up to a U.S. Study Tour in which CAR officials visited Washington, D.C. and areas of the Colorado River Basin. Task B supported applied research for water management solutions to the problems of the Aral Sea. Task C fostered partnerships between U.S. and CAR institutions to build local capacity and to address policy and technical water management issues. For Task D, a five-day international conference was to be organized and managed to present research findings and implications of policy reform, review the progress and impact of the U.S. partnerships, and to identify future actions and programs for regional cooperation in water management. Under Task E strategic support was designed where opportunities for key high-impact support to the water management policy and implementation process in the CAR were identified. Finally, Task F focused on identifying, procuring and providing equipment to CAR entities in support of the partnership program. A further description of the individual tasks follow below.

1. Task A: Workshops. Organize and conduct at least three regional workshops to respond to key technical and policy issues identified by the CAR officials who attended the study tour: information management; water management; and agricultural management. Establish a steering committee to assist in developing workshop topics and advise on workshop preparation. Members of the steering committee were to include representatives from the EPT Project, selected universities and Central Asian counterparts.

Overall objectives of Task A were training of the Central Asian counterparts so they would be capable of conducting workshops independent of the EPT project; identification of experts willing to review proposals; identification of topics for research; further definition of policy and technical constraints in regional water management, and identification of potential partnership organizations and entities.

2. Task B: Applied Research. Fund research that provides the least expensive environmentally-acceptable solutions to water management problems of the Aral Sea through subcontracts. Set up an evaluation committee, develop selection methods, execute subcontracts, and ensure the materials are presented at the regional conference as described in Task D.
3. Task C: Partnerships. Establish a partnership program between U.S. and the CAR institutions to build indigenous capacity for addressing policy and technical water management issues through exchange of issues and information on approaches and effective techniques. Establish criteria for U.S. and CAR participants and invite a selected number of U.S. experts to each workshop to provide technical expertise. One aim of the partnership activity was fostering a relationship between representatives from associations and agencies with sister facilities and encouraging site visits. These site visits would help establish working linkages to help guarantee program success.
4. Task D: Conference. Plan a five-day international conference in CAR designed to present research findings and implications for policy reform; review the progress and impact of the CAR-U.S. Partnerships; and identify future actions and programs for regional cooperation in water management. Develop content for the conference, organize and support logistical arrangements, and provide stipends for the attendance of selected Central Asian representatives.
5. Task E: Strategic Support. Identify and support key opportunities for high-impact support to the water management policy and implementation process in the CAR such as membership for CAR management professionals in professional organizations, their attendance at high-level conferences, and establishment of electronic communication networks among them. Investigate and support a regional water management journal to foster exchanges of information on promising approaches to water management problems.
6. Task F: Equipment. Identify, procure and provide equipment to CAR entities in support of the partnership program. Provide technical equipment for the various planned workshops.

2.2.3 Modification No. 2

Modification No. 2 to Delivery Order No. 8 increased the total obligated amount of the delivery order to allow for additional equipment purchases.

2.2.4 Modification No. 3

Modification No. 3 provided a no-cost six-month extension to the delivery order. The period of performance, therefore, changed from September 25, 1996 to March 31, 1997.

2.3 Project Goals and Strategic Objectives

Throughout 1996 and 1997, the EPT Project participated in the USAID Almaty Mission process of developing objectives, targets and indicators for its environmental program. The work of DO 6 was conducted under the Agency's strategic objective 3.3, "Reduced Environmental Risks in Public Health," associated with the indicator of increased regional cooperation in water resources management in the Aral Sea Basin and industrial and urban pollution abatement. Specifically, the work performed under DO 8 was linked to IRs 3.3.3 and 3.3.4 of this objective:

IRs. 3.3.3 and 3.3.4: Development of legal and regulatory framework conducive for reducing environmental risks to public health

- S** *Indicators:* Legal and regulatory regimes supports sustainable environmental management
- S** *Indicator definition:* Appropriate laws, decrees, and/or IRRs drafted
- S** *Unit of measurement:* Number of decrees, laws and IRRs

IRs 3.3.3.1 and 3.3.4.1 - Environmental policy (water and non-water) recommendations of selected progressive groups adopted

- S** *Indicators:* Improved quantity/quality of analysis and advocacy supporting high priority environmental policy and legislation
- S** *Definition:* CAR-U.S. analytical research/policy advocacy efforts in water management and other selected topics
- S** *Unit of measurement:* Number of joint analytical/advocacy efforts implemented
- S** *Target:* 4 by 1997

IR 3.3.3.2 - Regional strategies developed to reduce water pollution and consumption

- S** *Indicators:* Results of applied demonstration projects used for formulating strategies for efficient water usage
- S** *Definition:* Applied demonstration projects and CAR-U.S. partnerships in sustainable water management established
- S** *Unit of measurement:* Number of projects/partnerships

- S** *Target (demonstrations, CAR): 10 by 1997*
- S** *Target (partnerships, CAR): 2 by 1997*

Section 3

Delivery Order Deliverables

Article IV - Reports /Deliverables of Delivery Order No. 8, Modification No. 1 specified the following deliverables:

3.1 Overall Deliverable

- ! Propose indicators for success in connection with each of the specific tasks A-F.

3.2 Workshops

- ! Develop a list of topics and potential participants for a minimum of three (3) technical workshops to be held in the fall of 1994 and spring of 1995, for up to fifty (50) participants per workshop.
- ! Make or coordinate arrangements for the workshops, conduct the workshops, and prepare workshop conclusion reports.

3.3 Applied Research

- ! Fund applied research program on key topics in regional water management. The process should include, but not be limited to:
 - Establishing process and criteria for support of research through a subcontracting mechanism
 - Facilitating selection of research proposals and support for selected proposals
 - Facilitating process of review and final acceptance by review panel of research

3.4 Partnerships

- ! Develop, implement, and fund a partnership program in accordance with the framework discussed in the Scope of Work. This task should include, but not be limited to:
 - Develop, in consultation with USAID/Almaty and USAID/Washington, criteria for partnerships.
 - Identify potential agencies and entities to be part of partnership program and provide necessary financial and logistical support for establishing partnerships.
 - Evaluate and recommend (and implement as appropriate) a CAR database evaluation and improvement project in support of partnerships program, with

particular emphasis on methods used to gather, analyze, and disseminate data on water quality and quantity.

- Evaluate and recommend (and implement as appropriate) an electronic communication project that would provide Internet connections between US - CAR partnership organization
- Compile a roster of professional contacts and addresses for actual or potential CAR-U.S. partnership organizations. Distribute contact lists.

3.5 International Conference

- ! Organize and conduct an international conference for approximately 150 participants on or about January 1996, with published proceedings in Russian and English.

3.6 Strategic Support

- ! Develop a strategic support project in support of regional cooperation in general, and the partnership program in particular. This shall include, but not be limited to:
 - Identify professional international conferences that should be attended by CAR representatives.
 - Identify and organize CAR partnership organization training that may be beneficial to solving problems in CAR.
 - Identify international professional organizations that would be beneficial to the problem solving process in CAR. Identify and fund membership for Car partnership organizations and key CAR individuals.
 - Identify major U.S. suppliers of water user related equipment that would be willing to donate and/or demonstrate equipment at either the workshops or international conference.
 - Investigate, and support, if feasible, a regional journal on the subject of water management. Particular attention should be paid to augmenting existing regional publications to help foster regional cooperation on water management issues. Initiating new journals shall be considered if existing journals cannot serve the purpose of this sub-task.

3.7 Equipment

- ! Identify, procure and provide equipment, software and operation manuals to support Tasks A through E. This shall consist of a listing of equipment to be procured, the cost of each item, and an explanation of the procurement procedure to be followed in connection with each piece of equipment.

The status of deliverables produced under DO 8 is presented in Appendix A.

Section 4

Delivery Order Accomplishments

As stated in Section 1, the objective of the Regional Cooperation in Water Management Program under DO 8 was to help develop legal, policy, and institutional arrangements for the management of a complex water system with serious environmental problems. The program accomplished this objective by:

- ! Identifying and promoting areas of broad consensus among key groups in the CAR on the need for policy reform and regional collaboration in water management; and
- ! Strengthening multi-disciplinary regional cooperation and non-infrastructure approaches to water management through US-CAR partnerships, workshops, cross-cutting applied research and a series of working conferences to develop and apply policy approaches to a clearly defined set of problems.

The project funded 12 Applied Demonstration Projects, in collaboration with two U.S. Partner Institutions that focused on technical analysis and information management. In addition, U.S. experts in the area of water pricing provided technical assistance under EPT's partnership program. In 1995, the program introduced concepts of economic tools for environmental management, including water pricing, to the international water management community, and has aided the republics since that time in adopting such tools in national level mandates. By late 1997, the program had undertaken support of major efforts to develop multi-lateral water and energy sharing agreements to assist the republics in resolving one of the most contentious issues to arise in water sharing since the collapse of the Soviet Union.

This delivery order had very ambitious expectations for accomplishments and impacts. Those expectations were realized in numerous ways:

- ! The strengthening of existing water management institutions and the creation of regional bodies which are having positive impacts on water management decisions;
- ! The development and equipping of key water management researchers and research institutions working in areas of water quantity and quality assessment, monitoring and management;
- ! The organization and support for regional treaties on the allocation and management of the waters of the Syr Darya cascade.

4.1 The Project Steering Committee, The Environmental Policy and Technology Project's Regional Cooperation Working Committee

To meet objectives and implement project priorities the EPT Project organized a steering committee representing the five republics and regional water management organizations to guide the project and enlist regional participation. This committee was the primary vehicle for

coordination with and among the republics and with other international donor agencies. The specific tasks the Committee carried out included assisting the project with:

- ! Ranking and selection of applied demonstration projects and partnerships;
- ! Facilitation of work undertake under the applied demonstration projects;
- ! Developing workshop agendas and participant lists;
- ! Organization and facilitation of workshops and conferences;
- ! Peer review of applied demonstration projects;
- ! Advocating policy objectives of EPT policy objectives throughout Central Asia;
- ! Review and approval of applied demonstration projects.

By the end of the project, the steering committee compiled a report which outlines progress in advocating change in the water management sector and recommendations for the future. The outline of this report was presented to the international conference of the Sustainable Development Commission in December 1996. The major recommendations of this report were adopted as policies of this Commission, whose core membership is the ministers and chairpersons of the environment sectors in each of the five republics. The Steering Committee continues to function and it is expected to continue to have a significant voice in Regional Water Management decisions.

4.2 Workshops

During the project period, the Environmental Policy and Technology Project organized four regional workshops in Information Management (1994), Water Management Policies (1995); Water Pricing (1995); and Water Quality Management (1996). The first two workshops were designed to follow-up on the priorities generated from the 1994 Study Tour to the United States. During this meeting, issue priorities and selection criteria for the partnerships and applied research projects were generated. In addition, the workshops provided an opportunity for U.S. and Central Asia professionals to meet and develop project proposals to be submitted for funding.

The second two workshops, both related to agricultural water management, were designed to address priority issues related to water pricing and water quality management. During the workshop on water pricing, five issues for further investigation were developed which directed the course of the remaining work on Delivery Order No. 8. The water quality management workshop in Bukhara provided a forum for working group leaders of the water quality assessment component of the Program for Concrete Actions (funded by the World Bank and Interstate Fund for the Aral Sea [IFAS]). The leaders presented the results of a year-long project in each republic to define the status of water quality. Based on the presentations, participants of the group ranked the specific water quality problems identified to specific management strategies. By the end of the workshop, the group had ranked national and regional priorities to serve as a basis for water

quality management plans. These plans were taken back to each republic in the form of recommendations to the respective governments.

Table 4-1 Summary of Accomplishments of the EPT Project Workshops		
Workshop Title	Dates	Accomplishments
Information Management	Dec. 1994	Request for applied demonstration project and partnership proposals issued. Issues priorities and selection criteria distributed.
Water Management and Policies	May 1995	Water management strategies presented, including water pricing. Request for applied demonstration project and partnerships proposals issued. Issue priorities and selection criteria distributed.
Water Pricing in Central Asia	Nov. 1995	First regional conference on water pricing in Central Asia in which the issue was openly discussed as a major management tool. Five issues for further development were agreed to which served as the cornerstone of the EPT project throughout 1996 and 1997. These included a comparative analyses of water pricing and measurement schemes among the five republics; cost-based national-level water pricing; evaluation of trade-offs associated with various dam and reservoir operating regimes; and methods for compensating downstream countries for degradation in water quality.
Water Quality Management	Apr. 1996	Water quality problem priorities were listed and matched with economic tools for their management. Advocated action now oriented river clean-up program for republic and regional adoption. First recognition of participants of their ownership and responsibility for making recommendations to governments for solving remediable problems.

4.3 Applied Demonstration Projects

Regional Cooperation in Water Management encouraged proposals for projects to be conducted by individuals, institutions and organizations in the Central Asian Republics and for partnerships between CAR organizations and U.S. organizations. The guidelines for proposals were prepared, and submissions were evaluated according to how well the activity supported the technical assistance program of USAID in the need to share information and use it to develop practical solutions to water management problems in the Aral Sea Basin.

The applied demonstration projects (ADPs), carried out by local researchers and partnerships and

supported by U.S. experts, were awarded in late 1995. To the extent possible, local researchers were linked with American partners to maximize the amount of technical assistance that could be provided.

More than fifty (50) proposals were received and evaluated by a group of peers based on a set of criteria including program relevance and scientific merit. The Regional Cooperation Working Committee reviewed all proposals and made recommendations regarding their approval. The approved ADPs were as follows:

- ! *Short-Term Forecasting of the Amu Darya's Flow, Based on a "Reservoir" Model.* Dr. S. Myagkov, SANIGMI, Tashkent, Uzbekistan. This project addressed the need for automated forecasting models to optimize the operational management of water resources. Researchers developed a computerized short term runoff forecasting model with a hydrological data base of the Amu Darya. As the computer program was oriented to the needs of the Hydrological and Water Services of both Turkmenistan and Uzbekistan, the project has the potential for facilitating regional cooperation between the two republics. Moreover, the model can later be adapted to the Syr Darya basin
- ! *Optimization of a Surface Water Quality Monitoring Network for the Aral Sea Basin.* Dr. R. Toryanikova, SANIGMI, Tashkent, Uzbekistan, with counterparts in four other republics: E. Poznyak, Kazakhstan; M. Bakanov, Kyrgyzstan; N. Budnik, Tajikistan; Y. Feodorov, Turkmenistan. The water quality monitoring systems currently in place for the region's surface waters do not adequately measure contaminants and their distribution within the water system. Moreover, monitoring methods and parameters are inconsistent across the region. This project designed a common Central Asian surface water quality monitoring system, including: a structure for the network; a prioritized list of parameters and water bodies to be measured; the unification of existing programs, sampling and testing methods; and an information exchange process. This water quality monitoring network could aid in pollution control and water treatment and support effective policy and management decision-making and is highly likely to provide a basis for monitoring infrastructure to be provided under the auspices of a Global Environment Facility program for the Aral Sea basin
- ! *Water Quality Monitoring in the Epicenter of the Aral Sea Disaster Zone.* Dr. Zholibekov, Laboratory of Soil Science and Biotechnology, Institute of Bioecology, Karakalpakstan, Uzbekistan. While it is recognized that water quality in the southern Aral Sea is potentially hazardous to human health, there are no reliable data on the quality of water in the drinking water supply system. This project evaluated water quality along the untreated drinking water supply system, assessed the risks for human health and the need for water treatment equipment. The information gathered will be added to a growing data base of water quality in the region, all of which will support work on a water quality agreement for the Syr Darya basin and add to the dialogue on interstate water quality issues.

- ! *Assessment of Water Management's Impact on the Syr Darya's Tributaries (Within Kazakhstan).* L.K. Nekipelova, State Committee on Emergency Situations, Almaty, Kazakhstan. The project assessed the influence of economic activity on river flows, providing important information for water resources planning and management policies in the Syr Darya Basin. It interacted with the following two projects to provide a more complete understanding of the region's situation.
- ! *Evaluation of the Influence of Falling Aral Sea Levels on Precipitation in Adjoining Territories.* Dr. E. Vlasenko, KazNIIMOSK, Kazgidromet, Almaty, Kazakhstan. This project analyzed changes in water re-distribution over Kazakhstan and developed forecasts for the future. It estimated the impact of climate change on the Aral Sea region and the contribution of normal trends in climate change to the overall situation. This information will be used to develop management recommendations for the agricultural sector
- ! *Probability Forecast for Aral Sea Levels.* Dr. S. Shivarivova, KazNIIMOSK, Kazgidromet. The investigators used probability analysis to forecast the water balance of the Aral Sea basin; the analysis enables water managers to modify operating rules for reservoirs and rivers. It may also provide an information base to enable policy makers to express the urgency of addressing the Aral Sea problem in the short term to avert longer term consequences
- ! *Scientifically Based Methods in Water Use; Methodological Recommendations for Irrigation and Hydropower Water Tariffs.* Drs. D. Mamatkanov and K. Shavva, Institute of Water Problems and Hydropower, Kyrgyzstan, with counterparts in the other four republics: A. Kenshimov, Kazakhstan; V. Boltov, Tajikistan; O. Niyazov, Turkmenistan; A. Rafikov, Uzbekistan. Several factors have contributed to the "Aral Sea Crisis," including the removal of water from the contributing river systems for agricultural and other uses as well as water pollution. The regional nature of this problem requires that the different republics involved agree on an approach to water prices and tariffs. This project represented an important step in developing a regional consensus; investigators from all five republics developed tariffs and prices for water use in agriculture as well as interstate tariffs for water supply using a single methodology. The report of this project has become the initial reference on the subject for Central Asia and is used by governments and donor agencies alike.
- ! *Pricing During the Transition to Paid Water Use and Market Relations in the Central Asian Republics.* Dr. V. Dukhovny, MKVK, and Dr. M. Pinkhasov, SPA SANIIRI, Uzbekistan, with counterparts from three other republics: I. Umbetyaev, Kazakhstan; M. Sarkisov, Turkmenistan; and N. Nosirov, Tajikistan. The objectives of this project were to formulate pricing models for different water uses, to establish tariffs for different levels of water use and for contamination of water bodies by waste water, and to introduce commercial law for water. The above measures, if applied on the national level, will provide incentives for more efficient

water use and potentially provide some much needed financial resources for operational water supply organizations.

- ! *Economic Damage Assessment in Water Use: Component of Turkmenistan.* Dr. Sarkisov, Turkmenistan. This project addressed the economic impact of cross-border water pollution. The investigators developed a scheme for assessing damage to agricultural, industrial, municipal and fish farm users, as well as to the environment.

The ADPs were led by some of the most distinguished researchers in Central Asia. Because funding provided under the EPT umbrella came at a critical time (when leading institutes were unable to pay salaries and were laying off staff), many of the researchers and their associates were able to remain employed in their fields of expertise. With a small amount of funding, USAID was able to forestall some of the critical “brain drain” that was taking place in the field of water management at the time. In addition, much of the research was “cutting edge” which made a vast contribution. Further, involvement with USAID’s project promoted leadership among the investigators. For example, one research leader, who was a staff member at a local institution, is now widely recognized as an up-and-coming leader in the field of geographic information systems. He is now the direct of a GIS laboratory of the National Academy of Sciences Institute for Water Problems. Many such benefits were realized by individuals, institutions and the region.

4.4 Partnerships

In addition, partnerships between local, regional and U.S. counterparts were encouraged to develop cooperation on water management issues. Three such partnership areas received funding:

- ! *Amu Darya River Water Allocation Model.* Dr. A. Karimov, IEI, Tashkent, Uzbekistan, and Dr. D. McKinney, University of Texas, Austin, Texas, U.S.. Project counterparts cooperated on the following activities: comparison of the water management experiences and models of the CAR and Texas; development and implementation of the first phase (Amu Darya basin) of an Aral Sea Basin water allocation model; analysis of efficient water allocation alternatives for the Amu Darya basin; definition of sustainable allocation measures that are extendable to the other river basins in the Aral Sea region; training CAR personnel to maintain and extend the first phase model. This model is useful in comparing various water allocation scenarios in the CAR, based on different economic and hydrological development options.
- ! *Integrated Data Management for the Syr Darya Basin.* Drs. Bondelid and Brantley, Research Triangle Institute, North Carolina and counterparts in Kazakhstan, Kyrgyzstan, Uzbekistan and Tajikistan. The investigators collaborated with Central Asian counterparts to adapt an existing emissions management and decision support system to the Syr Darya Basin. RIMDESS (River Management Decision Support System) evaluates water resource management issues such as water pollution charges, mineralization and water pricing. This activity will promote cooperation and data sharing among

counterpart institutions within and among countries, with the objective of demonstrating the value of sharing and integrating analyses across disciplines and geographic areas. In support of this work, ADP investigators in the four counterpart countries collected data on hydrology and water quality and analyzed existing water quality standards. An analysis of current regulations on water quality and pollution control in Kyrgyzstan and Uzbekistan was also completed. Further, CAR collaborators were trained in model use and adaptation methods. CAR researchers included: A. Kenshimov, Kazakhstan; D. Mamatkanov and K. Bozov, Kyrgyzstan; E. Chembarisov and L. Piontkovskaya, Uzbekistan; and Z. Kurbanbekov, Tajikistan.

- ! *Technical Assistance in Water Pricing.* Implementation of water pricing as a cost recovery and demand management tool is viewed as a priority of the USAID program in Central Asia. The introduction and application of such approaches in Central Asia is challenging. The purpose of the partnership in water pricing was to provide technical assistance to the ADPs related to water pricing and damage assessment in an effort to fully explore issues that evolved from the region's first seminar on water pricing held in Bishkek, November 1995. U.S. experts drawn from the EPT consortium assisted the teams led by Dr. Mamatkanov and Dr. Dukhovny in exploring cost based pricing schemes, trade-offs in dam and reservoir operating regimes, and water prices attributable to degradation in water quality. This assistance was provided to local experts during the Water Pricing Technical Working Group meeting in Medeo in June 1996 and subsequent meetings with local experts on an individual basis. In addition, under this partnership, the U.S. team provided expertise during the Water Pricing Policy Committee meeting in June 1996 in Medeo, Kazakhstan. Continued technical assistance to the partnership team was provided under Delivery Order No. 12 to assist CAR policy makers with the resolution of issues important to implementation of water pricing throughout the region.

Through the partnerships, two major models for the Amu and Syr Darya were developed in coordination with local experts. Not only did the effort enhance the capacities of researchers and policy officials to understand and implement policy outcomes generated as the result of work with their American partners, but also it considerably advanced general knowledge of management options that are available to the region. In addition, under this Task a data base/professional roster of water management officials and contacts made during the project was developed. This database was published in directory form and distributed to primary contacts in the region.

4.5 International Conference

Delivery Order No. 8 called for the EPT Project to organize and conduct an international conference for approximately 150 participants on or about January 1996 and to publish the proceedings in Russian and English. At the direction of the USAID Mission in Almaty and with agreement from USAID/Washington this conference was organized in several segments. The results of EPT work under the applied projects were presented, and, with additional resources

provided for under Task 6 of Delivery Order No. 12, U.S. experts were retained to assist the participants in framing policy actions to be taken based on the results of the work achieved. In each case, the conference segments were used as fora for presenting work carried out under the EPT Project and for advancing policy recommendations that evolved from its activities. Through the combined efforts undertaken under the applied projects, partnerships, workshops and conference tasks, major policy recommendations were adopted by senior level officials throughout Central Asia. Water pricing, a topic that could not be discussed openly in 1994, was adopted by the Sustainable Development Commission in December 1996 as the single most important policy tool for re-mediation of the Aral Sea problem. In addition, by the end of 1996, the Energy and Water Uses Roundtable was beginning to draft an international agreement on the trade-offs in water use associated with the region's largest hydropower facilities in an effort to reduce the risk of conflict over water use priorities in the region.

Table 4 - 2		
Summary of Accomplishments of the EPT Project International Conference Segments		
Conference	Date	Accomplishments
Regional Water Pricing Policy Conference	June/July 1996	<p>Conference declaration to:</p> <ul style="list-style-type: none"> • develop separate agreements for the Amu and Syr Daryas to reduce the complicated mix of problems, better address issues specific to each basin, and expedite progress in reaching water sharing agreements; • pursue development of multi-year agreement in energy and water exchanges for the Naryn Syr Darya Cascade • pursue service agreements for multi-purpose projects that serve more than one republic <p>The President of Tajikistan issued declaration to implement water pricing on the national level as a result of conference.</p>
Water Pricing Technical Working Group	July 1996	<p>Technical assistance was provided to technical experts in water pricing involved in applied demonstration projects on water pricing and environmental damage assessment. Meeting provided an opportunity for peer interaction on water pricing issues. First time dialogue between opposing water management factions discussed pricing methods in an open forum. Group agreed that an environmental damage assessment of the Aral Sea Disaster Zone would be a good basis for developing water prices attributable to degradation in water pricing.</p>
Energy and Water Uses Roundtable	October 1996	<p>Water and energy officials from Syr Darya riparian republics agreed to develop a multi-year agreement on the energy and water exchanges related to the region's largest reservoir.</p>

Table 4 - 2 Summary of Accomplishments of the EPT Project International Conference Segments		
Applied Demonstration Project Review of Information Management and Water Quality Projects	October 1996	Results of applied demonstration projects in information management were presented to peer review panel which included the EPT Regional Cooperation Working Committee. Provided an opportunity for investigators to share results of work and collaborate and integrate efforts.
Executive Conference of the Sustainable Development Commission	December 1996	<p>Results of EPT Project activities were handed off to the Sustainable Development Commission. The RIMDESS system, placed in most of the member institutions, was presented to the Commission. The water pricing activities and environmental damage assessment results were also presented.</p> <p>The Commission, one of the two major regional water management organizations, adopted water pricing as the most viable management tool for the Aral Sea basin.</p> <p>The Commission also agreed to explore regional agreements for data sharing.</p>
Energy and Water Uses Roundtable	December 1996	This group drafted a resolution which contained principles for a multi-year agreement on the Toktogul reservoir.

4.6 Strategic Support and Equipment

Throughout the life of the regional cooperation program, the EPT Project continued to provide strategic support to local counterparts. Strategic support was often supplied at the request of the project's local researchers and working committee members. Travel to attend international workshops and travel to conduct research outside of Central Asia was afforded to several participants. Local counterparts from the riparian republics of the Syr Darya Basin were trained in two separate sessions on the use and adaptation of the RIMDESS river decision-support system developed under the partnership program. In addition, electronic communications between the U.S. and Central Asian counterparts and the working committee were supplied. The project had planned to support publication of the *Aral Herald*, a regional journal on water management issues that received wide distribution and is highly respected. However, the delivery order contract expired before arrangements could be made to transfer funds for support of this publication. In many instances, it was observed that the added support provided by the EPT Project to its participants made a significant difference in their level of professional credibility and respect in the region.

The EPT Project focused on providing computers, printers, data/fax modems to facilitate electronic communications between the Regional Cooperation Working Committee and provide modeling capability for the applied research and partnerships participants. The provision of equipment modernized the information management capability of the primary institutes and policy organizations of the water management sector of Central Asia. The equipment delivery under Task F of Delivery Order No. 8 was among the first of its kind in the region.

Section 5

Delivery Order Lessons Learned

The Regional Cooperation in Water Management program provided, in many ways, one of the few available means for regional entities to collaborate during the period the contract was in force. With shattered economies, water management officials were struggling to keep their governmental posts and were often not paid salaries for months on end. This program kept the mid and high level officials talking with one another about regional problems and kept the scientists working on water management issues employed for a year through this difficult transition period.

The delivery order called for meetings and granting of projects as deliverables. Deliverables of this type are not the best vehicle for policy reform. However, when combined with the technical assistance and development of policy positions of Task 6 of Delivery Order No. 12, the package was complete. Delivery Order No. 12, Task 6 provided the basis for advocacy, and Delivery Order No. 8 supplied the forum for carrying out advocacy programs.

The delivery order specified partnerships with federal agencies. However, under federal guidelines it is not possible to fund travel of federal employees under USAID contracts. It would have been advantageous to have organizations such as EPA, USGS, IJC and/or IBWC under this scope. However, the contracting mechanism did not allow for this. Outside of the federal realm, it is very difficult to find collaborators who will cooperate with host country counterparts without compensation for salary and travel.

The Regional Cooperation in Water Management program operated through its Regional Cooperation Steering Committee. Without its representatives little progress would have been made in effectively implementing the program. This Committee provided the project with a significant amount of good public relations. It also greatly fostered the project's credibility and disseminated its reputation throughout the region.

Appendix A
Status of Deliverables

Status of Deliverables

Task	Delivery Order Deliverables	Status of Deliverables
Workshops		
A1	List of topics and potential participants for 3 technical workshops	Lists included in: <i>Regional Cooperation in Water Management Information Workshop, November 27, 1994 - December 2, 1994</i> <i>Regional Cooperation on Water Policy and Management Workshop, May 2-6, 1995</i> <i>Summary of the Seminar on Water Pricing in Central Asia, Bishkek, Kyrgyz Republic, November 15-18, 1995</i>
A2	Workshop 1 arrangements, workshop, and workshop conclusion report	Results reported in <i>Regional Cooperation in Water Management, Information Management Workshop, Tashkent, Uzbekistan, November 28 - December 2, 1994</i>
A2	Workshop 2 arrangements, workshop, and workshop conclusion report	Results reported in <i>Regional Cooperation on Water Policy and Management Workshop, Ashgabad, Turkmenistan, May 2-6, 1995</i>
A2	Workshop 3 arrangements, workshop, and workshop conclusion report	Results reported in <i>Summary of the Seminar on Water Pricing in Central Asia, Bishkek, Kyrgyz Republic, November 15-18, 1995</i>
Applied Research		
B1a	Process and criteria for support of applied research	Process and criteria reported in: <i>Proposal Recommendations from Water Information Management Workshop, December 1994</i> <i>Guidelines for Competitive Grant Proposals in Water Resources Policy and Management</i> <i>Criteria and Selection Process for Partnership and Applied Demonstration Projects</i>
B1b	Selected research proposals and support for selected proposals	12 ADP proposals selected. Support provided to 25 individual subcontractors implementing these ADPs: <i>Amu Darya River Water Allocation Model</i> , D. McKinney and A.K. Karimov <i>Short-Term Forecasting of the Amu Darya's Flow Based on a Reservoir Model</i> , S. Myagkov. <i>Optimization of a Surface Water Quality Monitoring Network for the Aral Sea Basin</i> , R. Toryanaikova. <i>Water Quality Monitoring in the Epicenter of the Aral Sea Disaster Zone</i> , B. Zhollybekov <i>Assessment of Water Management's Impact on the Syr Darya's Tributaries</i> , L.K. Nekipelova <i>Evaluation of the Influence of Falling Aral Sea Levels on Precipitation in Adjoining Territories</i> , E.F. Vlasenko <i>Probability Forecast for Aral Sea Levels</i> , S.P. Shivaryova. <i>Scientifically Based Methods in Water Use: Methodological Recommendations for Irrigation and Hydropower Water Tariffs</i> , D.M. Mamatkanov and K.E. Shavva <i>Pricing During the Transition to Paid Water Use and Market Relations in the Central Asian Republics</i> , V.A. Dukhovny et al. <i>Economic Damage Assessment in Water Use: Component of Turkmenistan</i> , M.M. Sarkisov <i>RIMDESS Applied Demonstration Projects</i> , multiple authors
B1c	Review and final acceptance of research	Research reviewed and approved by peers and Working Committee. Results reported in: <i>Regional Water Pricing Committee Meeting, Regional Water Pricing Technical Working Group/Applied Demonstration Project Retreat, Medeo, Kazakhstan, June 23 - July 3, 1996</i> <i>Summary of the Applied Demonstration Project Meeting, Almaty, Kazakhstan, October 3-5, 1996</i> <i>Applied Demonstration Project Results</i>

Status of Deliverables

Task	Delivery Order Deliverables	Status of Deliverables
Partnerships		
C1	Criteria for partnerships	Criteria reported in: Report on <i>Criteria and Selection Process for Partnership and Applied Demonstration Projects</i>
C2	Identification of agencies/entities to be part of the partnership programs; support for establishment of partnerships.	Two partnerships established: <i>Regional Water Allocation Model for the Amu Darya, IEI, Tashkent and University of Texas, Austin Texas</i> <i>Integrated Data Management for the Syr Darya Basin</i> , Research Triangle Institute and counterparts in Kazakhstan, Kyrgyzstan, and Uzbekistan Results reported in: <i>Status of Aral Sea Regional Allocation Model for the Amu Darya</i> , January 1996 Trip Report - D. McKinney, Aral Sea Regional Allocation Model for the Amu Darya River, September 20 - October 7, 1996 <i>Status of Aral Sea Regional Allocation Model for the Amu Darya</i> , August 1996 Trip Reports - Integrated Data Management for the Syr Darya Basin: April 9-24, 1996; May 25 - June 13, 1996; June 20 - July 5, 1996; October 1-19, 1996; December 7-19, 1996; March 1997 <i>Model Development Aral Sea Regional Allocation: Model for the Amu Darya River User Manual for RIMDESS/Syr Darya - The River Basin Decision Support System</i>
C3	Evaluation/recommendation/implementation of a CAR database evaluation and improvement project	Results reported in: <i>Integrated Data Management for the Syr Darya Basin, Almaty, Kazakhstan, Tashkent, Uzbekistan, and Bishkek, Kyrgyzstan, October 1-19, 1996</i> <i>User Manual for RIMDESS/Syr Darya - The River Basin Decision Support System. March 1997</i>
C4	Evaluation/recommendation/implementation of an electronic communications project	Working Committee members provided with electronic mail
C5	Roster of professional contacts and addresses for partnership organizations.	Roster provided in : <i>Directory: Water Management and Environmental Professionals Working in Central Asia and List of EPT Regional Activities Program Contacts</i>
Conference		
D1	One international conference	Conference implemented in segments. Results reported in: <i>Regional Water Pricing Committee Meeting, Regional Water Pricing Technical Working Group/Applied Demonstration Project Retreat, June 23 - July 3, 1996</i> <i>Water Pricing Technical Working Group, July 1996</i> <i>Energy and Water Uses Roundtable, October 1996</i> <i>Applied Demonstration Project Review of Information Management and Water Quality Projects, October 1996</i> <i>Executive Retreat of the Sustainable Development Commission, Interstate Council for the Problems of the Aral Sea, December 9-11, 1996</i> <i>Central Asian Energy and Water Uses Roundtable Meeting, December 18-20, 1996</i>
Strategic Support		
E1	Identification of professional international conferences that should be attended by CAR representatives.	Conference opportunities identified. CAR representatives sponsored to attendee: <i>Water as a Critical Resource, Its Protection, Use and Management Conference, Tashkent, Uzbekistan, September 23-26, 1996</i>
E2	Identification/organization of CAR partnership organization training	Opportunities identified. Training provided and reported in: <i>Integrated Data Management for the Syr Darya Basin, Almaty, Kazakhstan, Tashkent, Uzbekistan, and Bishkek, Kyrgyzstan, October 1-19, 1996</i> <i>User Manual for RIMDESS/Syr Darya - The River Basin Decision Support System</i> Trip Report - Integrated Data Management for the Syr Darya Basin, December 7-19, 1996
E3	Identification of international professional organizations; funding of membership for CAR partnership organizations and individuals	Membership opportunities identified. Sponsorship of membership not undertaken due to expiration of delivery order
E4	Identification of US suppliers willing to donate/demonstrate water user related equipment	Equipment donation/demonstration opportunities identified. Results reported in: <i>Integrated Data Management for the Syr Darya Basin, Almaty, Kazakhstan, Tashkent, Uzbekistan, and Bishkek, Kyrgyzstan, October 1-19, 1996</i> <i>User Manual for RIMDESS/Syr Darya - The River Basin Decision Support System</i> Trip Report - Integrated Data Management for the Syr Darya Basin, December 7-19, 1996

Task	Delivery Order Deliverables	Status of Deliverables
E5	Investigation of/support for a regional journal on water management in the CAR.	<i>Aral Herald</i> developed and published
Equipment		
F1	Procurement of equipment.	Computer hardware and software to support Tasks A-F provided

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